

Abstract

5G has become a reality and as mobile carriers begin to roll-out their 5G infrastructure, academics are exploring 5G-like network simulations to learn more about what the future generation of mobile networking will look like. The available bandwidth provided to users around the world continues to grow and this has seen a rise in both network traffic and a rise in new kinds of services and applications. The last few years have seen a huge growth year-on-year in upstream video traffic with services such as Facebook Live, YouTube Livestreaming and Twitch.tv gaining popularity.

This work describes the design and implementation of a 5G end-to-end network simulation which simulates the transmission of video upstream from a mobile device to a remote host. The simulation was designed using the discrete event network simulator ns-3 and the 5G end-to-end network was implemented using a combination of the mmWave ns-3 module developed by NYU and the Evalvid ns-3 module developed by Gercom. A Quality of Experience framework was then set up at the remote host to evaluate the performance of the network in a range of experimental scenarios. This framework was centered on the use of the Video Quality Metric General Model developed by the NTIA.

The findings of this dissertation illustrate the potential that 5G has to offer in providing exceptional performance that will undoubtedly enable high-quality upstream video transfer. The findings also show some limitations of 5G mmWave networks including a sharp reduction in performance as users move into Non-Line-of-Sight conditions caused by obstacles and buildings. This means a high densification of 5G infrastructure will inevitably be required in Urban areas to guarantee high quality coverage. Finally, this work shows that MAC layers techniques such as Hybrid Automatic Repeat Request will be vital for sending video upstream in mmWave networks as it can help mitigate against packet loss due to rapid variations in channel quality.